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J. F. GEISLER,
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ABSTRACTORS:

L. H. FRIEDBURG, J. F. GEISLER.

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The Journal of the American Chemical Society appears monthly, except during July and August. It will contain all papers read before the Society, as well as abstracts from American and Foreign Journals, and a list of American Patents relating to Chemical Industries.

The Price of Subscription is $5.00 per year, in advance.

The Meeting Room of the Society is the Law Lecture Room, University Building, Washington Square, New York.

The Regular Monthly Meeting is held on the first Friday of every month, at 8 P. M.

Corresponding Secretary:

A. C. HALE, 551 Putnam Ave., Brooklyn, N. Y.

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The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, *if application for the same be made when the article is sent.*

Members are requested to give notice of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed to the Editor.

A. A. BRENEMAN, 97 Water St., New York.

Regular Meeting, March 20, 1891.

The regular meeting of the Society (postponed from March 6) was held in the law lecture room of the University Building.

The meeting was called to order at 8:15 P. M.

Vice-President Breneman in the chair.

The minutes of the February meeting were read and accepted.

The following were elected as members: C. P. Van Gundy, Eliza Furnace, Pittsburgh, Pa.; M. De Haigh, of Meyer Drug Co., St. Louis, Mo.; William Heim, East Saginaw, Mich.; Henry Heim, East Saginaw, Mich.; Prof. J. L. Jarman, Emory and Henry College, Emory, Va.; G. A. Kirchmaier, Toledo, O.; Oliver S. Ledman, 90 North High street, Columbus, O.; J. D. Pennock, Solvay Soda Co., Syracuse, N. Y.; Edw. D. Pearce, of T. P. Shepard & Co., Providence, R. I.; Prof. F. C. Robinson, Bowdoin College, Brunswick, Me.; Herbert W. Snow, of F. Stearns & Co., Detroit, Mich.; C. W. Teeter, Peoria, Ill.; E. F. Wood, Homestead Iron and Steel Works, Pittsburgh, Pa.

As an Associate: L. D. Arnold, Treas., Rumford Chem. Co., Providence, R. I.

The following gentlemen were proposed for membership:

Herbert S. Bird, N. Y. Tartar Co., Brooklyn, N. Y.
H. R. Hall, Carbon Iron Co., Parryville, Pa.
H. J. Seaman, Carbon Iron Co., Parryville, Pa.
Wm. J. Schieffelin, Schieffelin & Co., New York.
Charles E. Parker, Seabury & Johnson, East Orange, N. J.
Thos. P. Wiltshire, N. Y. Tartar Co., Brooklyn, N. Y.

As Associates:

Mr. A. P. Sharp, care Sharp & Doane, Baltimore, Md.
Dr. John B. Lynch, College Phys. and Surgeons, New York.

The following papers were then read: "Are Chemists generally prepared to abandon the Clark Test for estimation of Hardness of Waters?" By Prof. Albert R. Leeds.

After some discussion of this paper it was moved that a Committee of five be appointed to consider the hardness test for water and report to the Society.

The appointment of members of this Committee was deferred until the next meeting.

"On Condensation," by Wm. Bernhardt. Read by the Secretary in the absence of the author.

"Some Milk Analyses," by J. F. Geisler.

"A new form of Washing Bottle," presented by J. H. Wainwright, was described by the Chairman in the absence of the author.

"On a Quinone Oxime," by Dr. L. H. Friedburg. A sample of the preparation was shown.

The following miscellaneous business was then disposed of:

It was moved that a new committee be appointed to take the place of the one of last year to canvass for material for the JOURNAL. Carried.

The appointments were postponed until next meeting.

A communication from Dr. Britton, of Columbia College, upon the coöperation of scientific societies in N. Y. City was read and by unanimous vote referred to a committee of three, consisting of Messrs. McMurtrie, Waller and King, to be considered and reported upon at the next meeting.

mittee.

It was voted to appoint a committee of five to recommend a table of Atomic Weights to be approved and advocated by the Society.

The chair appointed Messrs. Geisler, Friedburg, Leeds, Waller and Doremus.

The following resignations were presented: C. Elton Buck, Wilmington, Del.; John C. Sticht, 81 Maiden lane, N. Y.

The resignations were accepted with the usual proviso.

The meeting was then adjourned.

DURAND WOODMAN,
Recording Sec'y.

ON THE ACTION OF NITROUS ANHYDRIDE UPON ORGANIC COMPOUNDS. A NEW QUINONE OXIME.

By L. H. Friedburg.

In continuation of former papers on this subject [1] I present to-day a compound obtained from methyl anilin and nitrous anhydride. We shall see that under the given conditions of work [2] the results attained were different from those which nitrous acid would have yielded. We know that the alkyl derivatives of anilin act somewhat similarly to the secondary bases of the fatty series. Thus, a nitroso derivative is formed according to the equation:

$$C_6H_5\ NH\ CH^3 + HNO_2 = C_6\ H_5\ N\ NO\ CH_3 + H_2O.$$

The action of nitrous acid upon tertiary aromatic bases would lead to para compounds in which hydrogen of the benzol nucleus is replaced by the nitroso group, *e.g.*, $C_6\ H_4\ NO\ N\ (CH_3)_2$. This reaction, however, has so far only been realized where hydrogen of the amido group had been substituted by fatty alkyls. Applying the reaction with which we deal in these papers to tertiary aromatic bases we shall surely be led to different results. This is to be reserved for further study.

Methyl anilin and nitrous anhydride. The latter was diluted with ice cold CS_2 and the $C_6\ H_5\ NH\ CH_3$, likewise cold, was allowed to drop into it very slowly, since even under these conditions the reaction is apt to be violent if not performed very gradually. A greenish, almost black, deposit forms at once. The mother liquor is filtered off rapidly, and the CS_2 of this latter evaporated in a current of air as quickly as possible. The residue upon the filter was treated with boiling water and gradually a light

[1] Jour. Amer. Chem. Soc., **12**, 7 and 54.

[2] *Ibid.*

brown body insoluble in water was obtained on the filter which readily sublimed as a yellow vapor to fine golden yellow needles, melting at +164° C. These could also be extracted from the brown body by glacial acetic acid, less readily by ether, very easily by pure benzol and by alcohol. When these solutions were allowed to crystallize several times, golden yellow needles one inch long resulted, melting sharply at +163° C. It was found that along with this compound had been extracted a dark orange-red substance, crystallizing from benzol in very minute golden scales. I have not, thus far, been able to obtain the nitroso reaction with phenol and conc. H_2SO_4 and the crystals of melting point 163°. The individual crystals have a perfectly golden yellow appearance, but when a mass of the same is heaped together, there appears a faint olive green hue belonging to the whole. An odor but faintly recalling that of quinone characterizes this substance.

The ultimate analysis of the compound, dried for months over sulphuric acid, furnished the following results:

0.516 grms. gave 51, 4 c. c. N at 20, 5° C. and 754, 39 bar. The N was collected in a moist state over KOH + aq. The volume corrected for temp. and pressure = *46.3 c. c.* $N = 11$, 24 p. ct.

0.1932 grms. gave 0.4737 CO_2 and 0.0721 H_2O, equal to 57.40% C and 4.14% H.

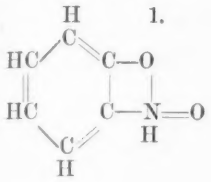
The percentage for the oxygenated substance is consequently:

Carbon	57.40
Hydrogen	4.14
Nitrogen	11.24
Oxygen	27.22
	100.00

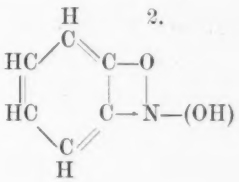
From these data is derived the simplest empirical formula $C_6H_5NO_2$.

Since it is evident that we have not to do here with a nitrobenzol, nor with a nitroso phenol, the required reactions not being

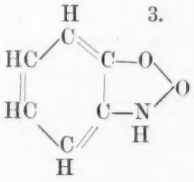
obtained, there remain but three possible formulæ (or isomers of them) for this remarkable substance:



1.



2.



3.

The reaction that seems to have taken place may be expressed thus:

$$C_6H_4HNHCH_3+2N_2O_3=C_6H_5NO_2+2N_2+CO_2+2H_2O.$$

The constitutional formula (2) may prove to be the most likely expression for the substance obtained, which, I have no doubt, is a representative of that new and interesting class of bodies termed quinone oximes.

In this case and under these conditions the action of nitrous anhydride upon methyl anilin has been an oxidizing one.

The study of this substance will be continued.

NEW YORK, March, 1891.

ARE CHEMISTS GENERALLY PREPARED TO ABANDON CLARK'S METHOD FOR ESTIMATION OF HARDNESS IN WATERS?

By Dr. Albert R. Leeds.

At the present time, when many chemists retain and others have laid aside Clark's method, it is difficult to discover what is signfied by the figures reported under hardness in a reported analysis, and it is most desirable that this obscurity should be done away with, and a uniformity of practice secured.

The objects in view, in the ordinary course of analysis, when hardness is determined, are as follows:

1st. Simply to place the water in the category of hard or soft waters. Usually private individuals desiring water analyses wish to know merely of their fitness for domestic use, and the estimation of the hardness by soap solution is adequate to supply the information needed on this point. But inasmuch as the analyst starts with an unknown water, which often turns out to be magnesian in character, or to owe part of its hardness to other constituents than lime and magnesia salts, the time expended in estimating its hardness, temporary and permanent, by soap, is greater oftentimes than that demanded by other methods.

2d. Soap destroying power. The analyst in his laboratory uses as nearly pure potassium oleate as he can prepare, and dissolves this soap in a mixture of two volumes of alcohol and one of water. His object is to so adjust his manipulation as to effect a combination of the lime and magnesia with the oleic acid, and to obtain from a table of hardness as near an approach to the actual quantities of these bodies, estimated as calcium carbonate, as possible.

To achieve this result, he frequently has occasion to dilute with distilled water and to manipulate with various refinements having no relation to the actual use of soap. For factory use the soad destroying power can best be determined by trial with the particular water and soap used ; for general purposes it can be sufficiently well estimated from the calcium carbonate equivalent deduced from titration with sodium carbonate.

Very frequently soap is used with water as hot as the hand can bear, and the valuable suggestion has been made by Mr. Herbert Jackson that on heating to 70° C * the soap test gives the same figures as are obtained by means of dilution. Even with this device, the results vary widely in many cases from the true calcium carbonate equivalent, while they do not necessarily give soap-destroying power.

3d. Boiler incrusting solids—"scale." Hardness, however determined, should not be used in judging of the scale-forming properties, but if chemists will persist in guessing, as they do at present, the Hehner figures allow of safer guess work than those obtained by soap.

4th. Character and amount of chemicals to be added before precipitation and filtration of hardening and scale-forming substances. Ordinarily this is effected by the addition of lime, soda or soda-ash, singly or combined. Now the Hehner method in its direct determination of alkalinity before and after evaporation with sodium carbonate bears a certain analogy with the process of softening. In practice a trial should always be made using the calculated amounts of reagents, for such is the effect of the condition and relative proportions of the salts present in water, that agreement between the theoretical and actual results after treatment is frequently lacking. Still it is obtained in a fair number of cases, and much more with the soda than with the soap titration. Moreover, when soda is employed, the softening as judged by the soap test, may be apparent (so far as scale is concerned) rather than real.

What is needed, both as to scale and its prevention, is a specia

* Chem. News, xlix., 149.

technical study having these two objects solely in view. A method followed will be indicated in a subsequent paper.

Having stated the objections which led me several years ago to abandon the soap test, I desire to give some experiments made at that time which appeared desirable before taking this step.

In the first place are minute variations in the conduct of the test, or of the temperature, etc., sufficient to originate discrepancies between the actual amounts of calcium carbonate equivalent and those given in the table of hardness, when the test solution of calcium chloride is employed and the test is performed in the usual manner. The experiments were made with potassium oleate dissolved in 2:1 dilute alcohol and of such strength that 14.25 c.c. produced a permanent lather with 50 c.c. CaCl solution = 20 pts. $CaCO_3$ per 100 c.c.

COMPARISON WITH ORDINARY TABLE OF HARDNESS. (By $CaCl_2$.)

Mgrms. $CaCO_3$ taken.	c. c. by Ordinary Table.	c. c. by Experiment.	Differences in c. c.	Mgrms. $CaCO_3$ by Experiment.	Differences Mgrms. $CaCO_3$.
0.0	0.70	1.05	0.35	0.55	0.55 +
2.0	2.05	2.15	0.10	2.21	0.21 +
4.0	3.60	3.90	0.30	4.43	0.43 +
4.0	3.60	3.80	0.20	4.29	0.29 +
6.0	5.00	5.58	0.58	6.80	0.80 +
8.0	6.40	6.41	0.01	8.01	0.01 +
10.0	7.80	7.90	0.10	10.15	0.15 +
12.0	9.15	9.30	0.15	12.26	0.26 +
16.0	11.75	11.78	0.03	16.10	0.10 +
20.0	14.25	14.25	0.00	20.00	0.00

The comparison shows that these discrepancies are practically of no importance.

In the second place, is it desirable to abandon the use of the ordinary table, calculated from Clark's Table of Hardness, and,

following a suggestion of Mr. Wanklyn, to take the equivalent of calcium carbonate directly from the soap titre minus a certain correction. For the purpose of this inquiry, I took 1.6 grms. oleic acid, exactly neutralized with decinormal soda made up to 300 c.c., and finding solution stronger than theory required, diluted until 50 c. c. water, containing the equivalent in $CaCl_2$ of 10 mgrms. $CaCO_3$ was exactly equivalent to 11.4 c. c. soap 50 c. c. distilled water alone was equivalent to 1.4 c. c. soap. The results were :

$CaCl_2$ sol. c. c.	$CaCO_3$ Mgrms.	Oleate Calculated.	Oleate Used.
10.0	4.0	5.4	5.40
15.0	6.0	7.4	7.40
20.0	8.0	9.4	9.45
25.0	10.0	11.4	11.40
50.0	20.0	21.4	21.50

By deducting 1.4 from the c. c. oleate used, the amount of $CaCO_3$ equivalent is obtained directly. Were the continuance of the soap best desirable on other grounds, the testing of this method with calcium and magnesia salts, singly and combined, would have been further prosecuted.

Thirdly, Would another salt of calcium give the same results taken from the Hardness Table, as $CaCl_2$?

A solution of standard $CaSO_4 = 0.200$ grm., per titre $CaCO_3$ was made up by adding 20 c. c. $\frac{N}{10}$ H_2SO_4 to 56 c. c. CaO solution containing 1 mgrm. per c.c. Different volumes of this solution were made up to 50 c. c. and titrated with a soap solution of 14.25 c. c. = 20 mgrm. $CaCO_3$ as determined with standard solution of $CaCl_2$.

TABLE OF HARDNESS. (By $CaSO_4$.)

$CaSO_4$ = $CaCO_3$ mgrms used.	c. c. by ordinary Table.	c. c. by experiment.	differences in c. c.	mgrms $CaCO_3$ by experiment.	differences mgrms $CaCO_3$.
0.0	0.70	1.05	0.35	0.55	0.55+
2.0	2.05	2.10	0.05	2.08	0.03+
4.0	3.60	3.60	0.00	4.00	0.00
6.0	5.00	5.00	0.00	6.00	0.00
8.0	6.40	6.40	0.00	8.00	0.00
10.0	7.80	7.80	0.00	10.00	0.00
16.0	11.72	11.70	0.02	15.95	0.05—
20.0	14.25	14.10	0.15	19.76	0.24—

A solution of $CaCO_3$ in CO_2 water was made with the view of holding as little free CO_2 as posssble. 50 c. c. = 20 mgms. $CaCO_3$ = 13.6 c. c. soap solution = 18.97 mgrms. of $CaCO_3$ per table. Further experiments showed that distilled water containing increasing amounts of dissolved CO_2 give corresponding differences from the titre obtained with Carbonic acid free water.

Fourth. Could a magnesium salt be made to give results corresponding to the equivalent $CaCO_3$ as taken from the table?

50 c.c. $MgSO_4$ sol. = 20 mgrms. $CaCO_3$ was titrated with soap run in 1 c. c. at a time and with much shaking. It gave no satisfactory end reaction but an apparent permanent lather at about 12 c. c. instead of 14.25 c. c.

Repeated with intervals of three minutes between each c. c., an unsatisfactory end reaction was obtained with 10 to 12 c. c.

25 c. c. $MgSO_4$ + 25 c. c. water was titred as follows:

First: 6 c. c. with 1 c. c. at 2 minute intervals.
6.7 c. c. at 5 minute intervals.
7.1 to 7.5 c.c. at 5 minute intervals.
7.5 not normal lather: 7.6 nearly normal.
7.6 to 7.8 c. c. at three 5 min. intervals.

The whole operation required an hour and the final result with a normal lather yielded 7.8 c. c. = 10 pts. per 100,000. In another experiment with less time and shaking 8.4 c. c. were used,

and the final outcome shows that with sufficient care and patience an agreement can be obtained in the case of magnesium salt (1 mol. CaO=1 mol. MgO) with theoretical figures up to the equivalent of 10 parts $CaCO_3$ per 100,000. But a method which necessitates so great an expenditnre of time, labor and care to obtain results that only in certain cases are approximately correct, should, it appears to me, be abandoned.

The results were as follows:

TABLE OF HARDNESS. (By $MgSO_4$.)

$MgSO_4$= $CaCO_3$ mgrms.	c. c. by Table.	c. c. by experiment.	differences in c. c.	mgrms. $CaCO_3$ by experiment.	differences mgrms.
2.00	2.00	2.10	0.10	2.08	0.08+
4.00	3.60	3.60	0.00	0.00	0.00
6.00	5.00	5.03	0.03	6.03	0.03+
8.00	6.40	6.65	0.25	8.35	0.35+
10.00	7.80	7.80	0.00	0.00	0.00
10.00	7.80	8.40	0.60	10.90	0.90+
20.00	14.25	12.00?			
20.00	14.25	10 to 12?			

In conclusion, I would ask whether the members are prepared to take formal action, and to recommend a rule of practice in estimating and reporting upon what shall be conventionally styled the "Temporary" and "Permanent" Hardness.

MILK ANALYSES.

By Joseph F. Geisler.

In presenting this short paper on the monthly analysis of the milk of a herd of cows I desire briefly to call attention to a few factors which deserve consideration in the production of milk.

Variations in the quality of milk are widest in the milk from individual cows, while milk from a herd of cows approaches more nearly a common average in composition. Aside from the number of cows which may have contributed to a given sample of milk, it is a known fact that the quality of the milk is directly affected by the breed of the cows, the condition of their health and surroundings, the time since the last parturition, the character as well as the quality and quantity of the food, and also to some extent the season and atmospheric conditions.

All cows will not produce equally good milk from the same class of fodder, and strange as it may seem it is reported upon good authority that a certain herd of cows produced a poor quality of milk as a direct result of overfeeding. The milk improved in quality when the quantity of fodder was properly regulated.

In the following table are given the monthly analyses of the milk from a herd of about twenty-five cows kept at Washingtonville, Orange Co., New York. The samples submitted to me were fair average samples for the days of the respective months and the data will give a fair idea of the variations to be expected in the milk from a herd of common native cows kept in good condition and subsisting on the character of fodder as noted in the accompanying table. On five occasions I was enabled to obtain the morning milk and the evening milk of the preceding day. Evening milk is generally somewhat richer in fat than the morning's milk, but in two of these cases the variation was very slight. It would have been interesting to know the exact yield of milk but

I was unable to obtain the data. In thirteen of the samples the milk sugar was estimated and the casein and albumen by difference. The average for milk sugar was 5.05% and for the casein and albumen 3.02%, the quantities fluctuating but very little from these averages. The fat was in all cases estimated by the Adams or *coil method* (see Jour. Amer. Chem. Soc., **12,** 488). For the taking of samples and the data as to feeding I am indebted to the kindness of Mr. F. D. Tuthill, Assist. N. Y. State Dairy Commissioner.

MONTHLY ANALYSES OF PURE HERD MILK.

When taken.	Sp. Gr. at 60° F.	Water. %	Total% Solids.	Fat. %	Casein% & Sugar.	Ash.%	Solids% Not Fat
1890.							
Jan. 11th, a. m.	1.0321	89.074	12.926	4.297	7.861	.768	8.629
Feb. 16th, *p. m.*	1.0310	86.977	13.023	4.396	7.899	.728	8.62
Feb. 17th, a. m.	1.0324	87.308	12.692	3.777	8.184	.731	8.91
March 16th, *p. m.*	1.0326	86.944	13.056	4.222	8.119	.715	8.83
March 17th, a. m.	1.0331	86.614	13.386	4.212	8.414	.760	9.17
April 13th, *p. m.*	1.0311	87.377	12.623	4.058	7.820	.745	8.56
April 14th, a. m.	1.0321	87.094	12.906	4.110	8.044	.752	8.79
May 25th, *p. m.*	1.0322	86.969	13.031	4.347	7.959	.725	8.68
May 26th, a. m.	1.0319	87.200	12.800	3.937	8.135	.728	8.86
June 14th, a. m.	1.0319	87.422	12.578	3.697	8.160	.721	8.88
July 21st, a. m.	Not taken	87.546	12.454	3.878	7.836	.740	8.57
Aug. 18th, a. m.	1.0318	87.155	12.845	3.890	8.195	.760	8.95
Aug. 24th, *p. m.*	1.0312	87.152	12.848	4.181	7.928	.739	8.66
Aug. 25th, a. m.	1.0313	87.558	12.442	3.716	7.990	.736	8.72
Sept. 22d, a. m.	1.0313	87.255	12.745	3.917	8.088	.740	8.82
Oct. 14th, a. m.	Not taken	87.045	12.955	4.021	8.182	.752	8.93
Nov. 24th, a. m.	1.0323	87.192	12.808	4.001	8.037	.770	8.80
Dec. 16th, a. m.	1.0321	87.299	12.701	3.955	7.995	.751	2.74

DAILY FODDER RATIONS.*

January 1890, ½ Bushel Brewery Grains, 4 qts. Bran, 2 qts. Hominy Meal.

February, 1890, ½ Bushel Brewery Grains, 4 qts. Bran, 2 qts. Hominy Meal.

* During the Winter months the cows had all the hay they wanted.

March 1890, ½ Bushel Brewery Grains, 4 qts. Bran, 2 qts. Hominy Meal.
April, 1890, ½ Bushel Brewery Grains, 4 qts. Bran, 2 qts. Corn Meal.
May, 1890, Grass alone.
June, 1890, " "
July, 1890, " "
August, 1890, Grass and ½ Bushel Brewery Grains.

September, 1890, " " " " " "		
October, 1890, " " " " " "		4 qts. Bran.
November, 1890, " " " " " "		8 qts. Bran.
December, 1890, " " " " " "		8 qts. Bran.

ON CONDENSATIONS.

By Wm. Bernhardt.

It was with deep interest I have read Dr. T. Sterry Hunt's paper on "mineral condensation," published in this journal and reprinted in the *Chemical News*, but, whilst accepting most of his views, it has seemed to me, that what is commonly called "condensation" is an expression comprising processes of very different kind, and of strongly distinguished characters. For instance, formaldehyde and the products of its condensation exhibit the distinctions between "condensation" in the strict sense of the word and identical with "polymerisation," and ordinary condensation, by which compounds result that cannot strictly be considered as polymeres of the original substance. Formaldehyde when kept for some time is partly transformed into solid paraformaldehyde, from which by applying heat formaldehyde may easily be regenerated. Not so from the sugars which result from treating the aldehyde with milk of lime, or with tin shavings. Although their aldehydic character can scarcely be denied and is manifested in the formation of alcohols under the influence of

nascent hydrogen, the reproduction of formaldehyde from them has not yet been performed, and it is doubtful if it ever can be performed. Condensation in the strict sense of the term should include the possibility of regenerating the original substance, a possibility which is lacking in the case of formose and similar sugars. Moreover, paraldehyde is a true product of condensation. I consider sulphur, phosphorus and arsenic, when solidified from their vapor, liquid chlorine obtained by cooling or compressing the gas, water, and, in short, all elements and compounds in the solid or liquid state directly convertible into their primary forms. The formula of common crystalline phosphorus in respect to the density of its vapor would be P_{333}, as becomes apparent from the following calculation, in which, however, neither the expansion by heat of the vapor nor that of the solid substance has been considered.

1 litre of hydrogen weighs 0.0897 grm.

1 " " phosphorus vapor (sp. gr. 62) $= 62 \times 0.0896$

1 " " " " contains 5.555 grms. of solid phosphorus

Sp. gr. of solid P. (water = 1) is 1.830

1.830 grm. solid P. therefore fills the volume of 1 c. c. of water.

Then by the proportion :

1.830 : 1,000 :: 5.555 .. x

We find $x = 3$ c. c. meaning that 3 c. c. of solid phosphorus, when converted into vapor, fills the volume of 1 litre. Condensation ensues in the proportion of 1,000 : 3 = 3 33 : 1. 333 is the coefficient of condensation of phosphorus, its formula therefore P. 333.

The complex nature of both solid and liquid elements becomes evident by calculations of this kind. To crystallized elementary arsenic a formula of about As 425, and to mercury of Hg 1,515 should be given. 1,696 volumes of the vapor of water yield 1 vol. of liquid water ; water therefore (H_2 O) is 1696.

Condensation, as appears from the instance of water, does not always take place in the order of gas, liquid, solid, but the liquid state may be of greater density than the solid one. Solid cast iron also swims upon the surface of the molten metal. In chloral,

upon addition of a small quantity of water, solidification ensues, chloral hydrate resulting; it is questionable, however, whether this process may be classified as a "condensation," the product, although solid, being of less spec. gravity than chloral.

As to most of the metals, their oxides and salts, we are entirely at a loss to determine their real molecular weights, calculation of them from the density of their vapor being only possible in the comparatively few cases which permit of volatilization; there seems to be little doubt, however, that in their formation condensation is mostly combined with a chemical change excluding the possibility of restoring the original substance by simple physical means. Such changes generally occur in the formation of precipitates; they are especially evident in the decomposition of neutral bismuth and antimony salts by water. Still there are various exceptional cases, in which, by applying or withdrawing heat, a precipitate already formed is again dissolved. Most soluble salts are more readily dissolved by warm than by cold water; calcium citrate, on the contrary, readily dissolved by cold water, is precipitated by heating the solution. There can be little doubt that in such cases some chemical change occurs, a soluble combination of calcium citrate and water existing, which is decomposed by heat, but restored on cooling. A similar change occurs, when a solution containing calcium tartrate and potassium hydroxide is heated.

Heat is one of the mightest promoters of chemical combination on the one hand, of decomposition on the other, and is indeed the chief agent in most chemical processes; furthermore, the doctrine of thermo-chemistry is founded upon the appearance or disappearance of heat in every disturbance of chemical equilibrium. Still, heat has always been considered as a physical force, and the modern kinetic theory regards it as a kind of movement which, when transferred to the molecules of any substance, may induce chemical alterations, also consisting of particular kinds of motion. These reasons entitle us to distinguish the effects of heat from those of other chemical agents and to classify the products of condensation in the following way:

1. *Physical condensation* or *polymerisation* consists in an aggregation of atoms in a molecule, by which, the constituents and their

percentage remaining unaltered, a complex molecule is formed, from which, however, by the application of heat the original molecule can be restored. For example, sulphur, phosphorus, arsenic, mercury, chlorine, iodine, bromine, water, paraldehyde, metaldehyde, etc.

2. *Chemical condensation* consists in an aggregation of atoms in a molecule, which, together with changes of the atoms as to their relative position and of the molecular structure, produces a complex molecule, from which by means of heat the primary molecules cannot be restored. For example, many insoluble precipitates of metallic compounds, fixed solid elements and compounds in general.

It is hoped that these few suggestions may contribute to a more precise understanding by the expression "condensation," and may separate such natural processes into classes of different character.

THE CHAPMAN WASHING BOTTLE.

(Communicated by J. H. Wainwright, Ph. B.)

A reference to the figure will explain the new form of wash bottle suggested by Mr. E. J. Chapman, of the U. S. Laboratory.

It consists of an ordinary tubulated flask, such as is used for distillations, fitted with two soft rubber stoppers each having a single perforation, as shown.

The spout, consisting of a small piece of glass tubing drawn out as usual, is inserted in the stopper on the side of the neck and the bottle is used by simply pouring the washing liquid from the spout, keeping the thumb applied to the perforation in the cork closing the neck.

The stream delivered can thus, with a little practice, be very nicely regulated from single drops to a steady stream, as desired.

The simplicity of this little piece of apparatus and the readiness with which it can be made from the ordinary materials at hand in almost any laboratory render it especially convenient, and it will be found particularly useful in the employment of such solutions as ammonia, molybdate solution, etc.

Abstracts of American Patents Relating to Chemistry.

(*From the U. S. Patent Office Gazette.*)

Issued February 10, 1891.

445,977.—Pad for rapid copying. Louis Neuhaus and Felix F. Daus, New York, N. Y.

Pad composed of mixture prepared by mixing three parts of dry and powdered china clay No. 1, one part of French powdered chalk and one-half part of plaster of paris, and adding to this mixture, by kneading or otherwise, the composition resulting from mixing three-quarter parts ordinary starch, three-quarter parts dissolved dextrine, one sixty-fourth part of chloride of calcium in the pure crystal, one-sixteenth part of ordinary sugar, and one and one-quarter part of liquid glycerine.

445,982.—Apparatus for the reduction of petroleum into gas. Fritz Dürr, Munich, Germany.

446,004.—Method of producing colored impressions. Robert Schorr, Würtemberg, Germany.

446,009.—Yellow dye. William Pfitzinger, Elberfeld, Germany.

A dye prepared by treating the diazo compound of thioparatoluidine sulpho-acid with the sulpho-acid of the same thio derivative of the paratoluidine.

The coloring is easily soluble in water with a clear greenish-yellow color, turning red on the addition of acetic acid, precipitating as a red powder by adding mineral acid; it is destroyed by concentrated sulphuric acid or boiling diluted mineral acid with evolution of nitrogen, and it dyes unmordanted cotton a bright greenish yellow in alkaline soap bath.

446,018.—Paint from residuum of vegetable oils. George W. Scollay, New York, N. Y.

446,019.—Art of making paint. George W. Scollay, New York, N. Y.

446,021.—Apparatus for storing and preserving food. Lyman Smith, Chicago, Ill.

An hermetically sealed box, in which food can be treated with carbonic acid.

446,041.—Paper pulp boiler. Solomon R. Wagg, Appleton, Wis.

446,046.—Photographic camera. Frank Whitney, Chicago, Ill.

446,050 and **446,051.**—Apparatus for dyeing straw goods, etc. James A. Young, Boston, Mass.

446,055.—Ore concentrator. Marcelin Castelnau, Paris, France.

446,060.—Apparatus for making sulphuric acid. Emil Delplace and Jules Delplace, Aubervilliers, France.

446,064.—Brick machine. Collier V. Hemenway, Wellington, Ohio.

446,077.—Machine for liquidizing milk. George Roth, Highland, Ill.

446,087.—Phosphate and process for making the same. Joseph Van Rumbeke, Chicago, Ill.

Iron and alumina phosphate are first treated with sulphuric acid, then treated at a temperature of 400°–800° Fahr., until the acid phosphate is changed into metaphosphate, usually indicated by the product assuming a gray color.

446,088.—Nitrogenous fertilizer. Joseph Van Ruymbeke, Chicago, Ill.

446,117.—Process of and apparatus for purifying grease. George Race, Norwich, N. Y.

The grease is floated while in a liquid state over currents of water running in the opposite direction and jets of steam and air are forced successively through the water and liquid grease.

446,145.—Roofing paper. Henry Cunningham, Bachtown, Ill.

A roofing paper having a coating of linseed oil and charcoal.

446,149.—Sizing apparatus for slime, etc. Carl A. E. Mimicke, Clausthal, Prussia, Germany.

446,153.—Filter. John S. Roake, Brooklyn, N. Y.

446,191.—Decorating sheet metal for ceilings, etc. Edward Püttmann, Schivelm, Germany.

446,205.—Ice machine. Edward J. Hardy, Brooklyn, N. Y.

446,248.—Milk testing and separating machine. Dyer Cooper, Philadelphia, Pa.

446,252.—Freezing apparatus. Jacob Erny, Zach. T. Subers, William Hoos, Philadelphia, Pa.

446,265.—Wall and ceiling polish. Thomas J. Neavitt.

Composed of white spirits of turpentine, light colored mastic, and light colord sandarac in equal quantities, oil of lavender, powdered glass, and white oil of poppy..

446,285.—Disinfecting paving composition. John Fottrell, New York, N. Y.

446,294.—Method of preparing water proof material. Harry A. Schlessinger, London, England.

446,344.—Lubricating oil. Robert R. Graf, Baltimore, Md.

A fireproof lubricating oil consisting of a mixture of an ordinary lubricating oil with sodium tungstate, ammonium sulphate, ammonium phosphate, sal ammoniac and sodium monocarbonate.

446,351.—Aluminum alloy. John A. Jeancor, Newport, Ky.

A bronze or alloy of copper, aluminum and manganese in about the proportions of seventy-five to eighty-five per cent. of copper, twelve to twenty-five per cent. of aluminum, and two to five per cent. manganese.

446,382.—Composition for plastering. Reuben G. Farnham, Elbridge. Composed of jute, Portland cement and marl.

Issued February 17th, 1891.

446,458.—Cement for joining the ends of driving belts. Carl Löchert, Berlin, Germany.

A mastic or cement for joining straps or driving belts, consisting of a mixture of glue, vinegar spirit, alum, spirits of turpentine, shellac and potassium chromate.

446,469.—Milk testing device. Alban H. Reed, Philadelphia, Pa.

446,500 and **446,501.**—Apparatus for vulcanizing wood. James P. Whiterow, Pittsburg, Pa.

446,502.—Composition of matter for cable-filling. Edward G. Wright, Kansas City, Mo.

The composition consists of crude petroleum, tallow, gypsum, whiting, pine tar and paraffine wax.

446,505.—Composition for combustible briquettes. Hayden M. Baker, Brooklyn, N. Y.

Composition consists of finely divided organic waste, a sodium di-or trisilicate in aqueous solution and of a sp. gr. of 30°—65° Beaumé, and an alkaline nitrate or its described equivalent.

446,527.—Secondary battery. Arthur M. F. Laurent-Cély, Paris, France.

"The process of forming material for secondary battery plates, consisting in fusing or melting lead chloride, adding metallic zinc thereto, and subsequently running the mass into a large receiver and allowing the impurities of the mixture to fall to the bottom of receiver," etc.

446,544.—Battery compound. William Wright, New York, N. Y.

An electrolyte containing a salt of alumina or other aluminum compound treated with sulphuric acid and sodium bichromate.

446,572.—Dyeing vat. Josiah R. Proctor and William B. Keefer, Philadelphia, Pa.

446,604.—Composition of matter for restraining the setting of plaster compounds. Edward Watson, Grand Rapids, Mich.

The composition consists of a leguminous substance, such as peas, beans, lentils, etc., slaked lime, sodium carbonate, an alkaline earth, or a salt of an alkaline earth, or a salt of a caustic alkali.

446,651.—Extractor churn. Adolph Wahlin and Carl Lundström, Stockholm, Sweden, and Thomas Collins, Winchester, N. H.

446,652.—Apparatus for making sulphite lye. Alexander Wendler and Jul. Spiro, Watertown, N. Y.

446,654.—Compound for paving, roofing and building purposes. Henry F. Williams, San Francisco, Cal.

Consists of a mixture of asphalt and refined lard or lard oil.

446,658.—Ore or rock breaker. Charles G. Buchman, Rockaway, N. J.

446,660.—Carbon for electric lamps. William H. Burns, Los Angelos, Cal.

Composed approximately of ninety parts of triturated purified maltha coke and ten parts of semi-liquid purified maltha thoroughly incorporated therewith.

446,669.—Manufacture of filaments for incandescent electric lamps. Thomas A. Edison, Menlo Park, N. J.

446,683.—Method of coloring clay ware. Gustav Hotlinger, Chicago, Ill.

The method consists in introducing into the kiln after the burning of the ware is complete a coloring agent in a liquid form and in the presence of a moistened atmosphere.

446,706.—Amalgamating apparatus. Thomas Gemmel, London, England.

446,727.—Pyro-chemical battery. John Blair, North Orillia, and Alex. G. Hunter, Dundalk, Ontario, Canada.

446,815.—Process of making alkaline phosphates. Charles Glaser, Baltimore, Md.

A salt of an alkali and an acid volatile at higher temperature are fused with crude commercial phosphoric acid in excess of an amount required to form a pyro-phosphate; secondly, the fused mass is dissolved in water and boiled until conversion of meta and pyro-phosphoric acid is effected; thirdly, the product is treated with the carbonate of an alkali (or free alkali) till alkaline reaction is obtained, and finally the solution is filtered and the salts are crystallized.

446,818.—Marine paint. John N. Longden, New York, N. Y.

Moist precipitated copper is incorporated with a paint vehicle and the mixture stirred at a temperature sufficiently high to drive off the water.

Issued February 24th, 1891.

446,845.—Artificial fuel. Isidore C. Bandman, Atlanta, Ga.

A compound composed of fragments of coal or other similar solid fuel cemented into a block by means of an imflammable compound composed of rosin, sawdust and black or peroxide of manganese.

446,854.—Dyeing machine. Joseph P. Delahunty, West Pittston.

446,860.—Covering for steam or hot water pipes. Charles E. Gilman, Eldora, Iowa.

The covering consists of burned porous earthenware having incorporated therein an incombustible fibrous mineral substance, the covering being united to the pipe by a layer of cement.

446,875.—Compound of iodine with thymol. Joseph Messinger and George Vortmann, Aix-la-Chapelle, Germany.

"A new iodine substitution product of thymol, which is an amorphous odorless powder of a brown-red color, insoluble in water and alkali and difficultly soluble in alcohol, more easily in ether, and easily in oil, melting at about 110° centigrade under decomposition.

446,877.—Composition for coating bricks. John Miller, Cincinnati, Ohio.

Compound composed of beeswax, paraffine, and an alcoholic solution of shellac.

446,887.—Preparing food from milk curd. Albert W. Rehnström, Mülhausmar, Sweden.

446,892.—Alizarine Derivative. Robert E. Schmidt, Elberfeld, Germany.

Derivative obtained by "oxidizing alizarine bordeaux (tetraoxyanthraquinone) in sulphuric acid solution with oxidizing agents, such as manganese or arsenic acid, then boiling, filtering and washing and subsequently dissolving the precipitate in hot dilute alkali and filtering and precipitating the coloring matter with acid.

The coloring matter said to form a red-brown paste, or when dried a brown powder, insoluble in water, easily soluble in soda lye with blue color tinged with violet; it dissolves in concentrated sulphuric acid with a pure blue, the solution showing a beautiful fluorescence, and in glacial acetic acid or alcohol it dissolves with a more yellowish or bluish-red color of moss-green fluorescence and crystallizes from it in beautiful dark or blackish-brown glittering needles.

446,893.—Alizarine Derivative. Robert E. Schmidt, Elberfeld, Germany.

Obtained by oxidizing dried alizarine (dioxyanthraquinone) with large quantities of fuming sulphuric acid of a high precentage of anhydride at a low temperature, pouring the melt on ice and filtering the intermediate product from the yellowish-brown deposit formed, dissolving the same in soda-lye, and adding diluted mineral acid to the boiling solution to precipitate the coloringmatter; this is a yellowish red paste insoluble in water, easily soluble in soda-lye and in concent. sulphuric acid with a blue-viloet color, and crystallizing from glacial acetic acid or nitro benzole in garnet-red needles not melting at 280° C, and having the composition $C_{14} H_8 O_6$.

446,911.—Process of manufacturing Portland cement. Henry C. Baum, Denver, Colo.

Wet marl is united with quicklime whereby the mixture resulting from the chemical reaction is rendered perfectly dry preparatory to grinding.

446,922.—Fireproof paint. Isaac L. Merrell, San Francisco, Cal.

The composition consists of "aluminum, asbestus, soapstone, sodium silicate, magnesia, mica, fireproof clay, lime water, and a cohesive liquid, such as glue in solution, with or without coloring matter or substance.

446,971.—Roasting and smelting furnace. William Heckert and others, Findlay, Ohio.

446,983.—Chemical retting and ungumming of textile fibres. Charles De La Roche, Paris, France.

446,996.—Ore roasting furnace. George N. Phelp, Brooklyn, N. Y.

446,998.—Making phosphatic fertilizers. Joseph Van Ruymbeke Chicago, Ill.

Iron and alumina phosphate are pulverized, mixed with muriate of potash, or preferably low grade sulphate of potash, the mixture treated with sulphuric acid and then subjected to heat until the acid phosphate contained therein is converted into metaphosphate.

447,063.—Process for making artificial cryolite. Englebert Richters, Sauran, Germany.

447,087.—Process of printing in colors. William Schumacher, Brooklyn, N. Y.

447,121.—Sticky fly paper. Henry W. Stecher, Cleveland, O.

447,131.—Process of making malt liquor. John Griffiths, Brooklyn, N. Y.

447,138.—Artificial fuel. Rudolph J. Schimpeo, Jersey City, N. J.

Powdered charcoal saturated with solution of lead acetate, with lime and gypsum, and compressed into blocks.

447,155.—Apparatus for the calcination of cement. Paul Krotnaurer, White Hall, Pa.

447,189.—Red dye. Paul Julius, Ludwigshafen-on-the-Rhine, Germany.

Substantive red dyestuff (sodium salt of diamidodiphenyleneketoxime diazo-naphthionic acid) which appears in the form of a dark colored powder giving a brown streak on rubbing. It is readily soluble in both cold and hot water, yeilding bluish red solutions; it is almost insol. in alcohol even on boiling; insol. (or practically so) in benzine and ether; it dissolves readily in conc. H_2SO_4 giving blue solution, which on addition of water gives a blue precipitate. Calcium chloride gives a brownish red precipitate and copper chloride a dark brownish purple one.

J. F. G.